

WIDE-ANGLE CONSTANT-VELOCITY JOINT, IMPROVED TO EXTEND  
LUBRICATION TIME AND REDUCE THE LOSS OF LUBRICANT

DESCRIPTION

5 The invention relates to a constant velocity joint - especially for  
wide-angle applications - which is improved in order to achieve the objects  
of: extending the life of the grease lubrication of the joint and hence  
increasing the time between one injection and the next; and minimizing the  
loss of lubricating grease.

10 These and other objects and advantages will become clear from the  
text which follows.

The constant-velocity joint is of a conventional type that comprises  
two forks forming input and output members of the joint, two spiders, and a  
central core forming a housing for sliding movement - in a transverse plane  
- for at least one basically discoidal constraint member that forms the seats  
15 for the spherical end heads of the two forks; said constraint member moves  
about in a transverse plane of symmetry of the central core, to which two  
surfaces of said housing are parallel. Frequently between each of said two  
surfaces and the opposing face of said constraint member a laminar ring is  
interposed, resulting in continuous annular contact with said surface and  
20 with said opposing face of the constraint member. This is done in an effort  
to reduce the loss of lubricating grease, which is mostly there to lubricate  
between the spherical heads and their seats.

To maintain the functionality of said laminar rings, according to the  
invention said laminar rings are of an elastic material and shaped as  
25 Belleville washers (diaphragm springs), in which the outer edge bears and  
presses continuously on said surface and the inner edge bears and  
presses continuously against the opposing face of the constraint member.  
Advantageously, both of said laminar rings are of an elastic metal and  
shaped as Belleville washers, in order to press as stated above.

30 A clearer understanding of the invention will be gained from the  
description and attached drawing, the latter showing a practical non-  
restrictive example of the invention. In the drawing:

Figs 1 and 2 show a constant-velocity joint in longitudinal section, in  
two positions which it is capable of assuming;

Fig. 3 shows certain components of the said joint in an exploded view; and

Figs 4 and 5 show in isolation one of two laminar sealing rings according to the invention, in end view and in section taken on V-V as  
5 marked in fig. 4.

The appended drawing (Figs 1 and 2) illustrates a wide-angle constant-velocity joint. Reference 1 denotes a tubular component of a telescopic shaft, which ends in a wide-angle constant-velocity joint 5. The telescopic shaft 1 may be fitted with a protective sheath. The constant-  
10 velocity joint 5, which is of the wide-angle type, comprises a power coupling member 9, for the input or output of the joint, which forms a splined seat 9A for connection to a drive member with which the constant-velocity joint is combined. The member 9 is integral with the base 10A of a fork 10 forming part of the said joint 5. The telescopic shaft 1 is engaged on  
15 a member 12 integral with the base 14A of a fork 14 belonging to the said constant-velocity joint. Each of the two forks 10 and 14 possesses a terminal crosspiece 10C, 14C, from which a spherical head 10B, 14B projects. Said two spherical heads are opposed to each other. The constant-velocity joint also includes a central core 16, consisting of two  
20 parts that are more or less symmetrical about a plane lying transversely relative to the general axis of the joint, when the input and output components of the members 9 and 12 are lined up with each other. Said two parts of the member 16 are joined to each other at 16S by welding, or by other means, such as bolts. The central core 16 has two opposing pairs  
25 of projections 16A, the projections of each pair forming seats in which a respective spider 18 can rotate. Each spider 18 is further pivoted to the corresponding fork 10, 14, respectively, described above. The arrangement described above gives a typical constant-velocity joint, which is further  
completed by a constraint member 20 of discoidal shape having a central  
30 circular cylindrical through seat 20A, in which the opposing spherical heads 10B, 14B of the two forks 10 and 14 are received. The discoidal constraint member 20 is housed in such a way that it can slide inside a discoidal housing 24, which is formed by two parallel opposing walls 24A, 24B formed by the two components of the central core 16. These two

components are suitably machined and welded at 16S or otherwise joined together to imprison the discoidal constraint member 20, 20B in such a way as to allow it to move about. The central core 16 is fitted with a grease nipple 28, which reaches the discoidal housing 24 via the discoidal  
5 constraint member 20. This member 20 has at least one radial hole 30 for communication between the housing 24 and the through seat 20A. This enables lubrication of the sliding surfaces 24A, 24B and the discoidal constraint member 20, and between the through seat 20A and the spherical heads 10B, 14B.

10 The above description was of an example of a shaft with a known type of constant-velocity joint, of the kind capable of transmitting drive even through a large angle, such as the angle  $X^\circ$  as shown in Fig. 2, the purpose of which is well known. There are frequently two laminar rings 40 which are flat and are interposed between the surfaces 24A and 24B and  
15 the two faces of the discoidal constraint member 20, to reduce the loss of lubricating grease from the discoidal housing 24 to the exterior, whereas efficient lubrication is required between the spherical heads 10B and 14B and the seat 20A for these.

In the conventional versions, the efficiency against the leakage of  
20 lubricating grease obtained with these flat laminar rings 40 is limited, which therefore requires frequent supply of grease from the grease nipple in order to ensure a sufficient lubrication between the cylindrical inside surface of the through seat 20A and the spherical heads 10B and 14B, so that the joint does not rapidly become unusable.

25 According to the invention, and as is clear in Figs 3 and 5, the laminar rings 40 are used in the form of Belleville washers (diaphragm springs) made of an elastic material, particularly a spring metal.

As can be seen in Fig. 3, when the two laminar rings 40 are inserted  
30 between each of the faces of the discoidal constraint member 20 and the surfaces 24A and 24B, before connecting the two parts of the central core 16 by welding them at 16S, the two rings 40 are more or less compressed and deformed axially, causing the internal edges 40B to press with continuity against the corresponding face of the member 20 and the outer edges 40C to press with continuity against the respective surfaces 24A and

24B. The effect is to sharply reduce the loss of lubricant between said surfaces 24A, 24B and the faces of the discoidal member 20, and the lubrication is sustained for a very long period between the spherical heads 10B, 14B and the seat 20A, obviating the need for frequent injections of grease from the grease nipple 28. Besides keeping the constant-velocity joint running, it also consumes less lubricant and greatly reduces the environmental pollution which would occur with leaking lubricant.

In an alternative embodiment, it is possible to have only one laminar ring 40 shaped as a Belleville washer and the other flat and stressed - by the same Belleville washer ring 40 - to press against the surface of the core and against the face of the constraint member 20. This is functional enough for the purposes of lubrication and joint life.

It will be understood that the drawing shows only an example provided purely as a practical demonstration of the invention, which latter may be varied in its shapes and arrangements without thereby departing from the scope of the concept on which the invention is based. The presence of any reference numbers in the appended claims is for the purpose of facilitating the reading of the claims with reference to the description and drawing, and does not limit the scope of protection represented by the claims.